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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/506,854	09/02/2004	Michael Bock	BOS0067	4503

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EXAMINER	
PILKINGTON, JAMES	

ART UNIT	PAPER NUMBER
3682	

DATE MAILED: 11/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/506,854	BOCK ET AL.	
	Examiner	Art Unit	
	James Pilkington	3682	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 November 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 September 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. DE 10217123.8, filed on April 17, 2002.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the spring element/anti-twist device running between the support ring and the housing (clms 5 and 7, currently drawings only show the spring element running between the bearing and the housing), a plate spring (clm 6) and a relay or FET semiconductor (clm 13), must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an

application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

3. Claims 4, 5, 6, 11 and 13 objected to because of the following informalities:

- Clm 4, ln 2 reads "said loose bearing bearing against" should be - - said loose bearing bears against- -
- Clms 5 and 7, ln 3 reads "and said housing and between said support ring" the examiner believes this should be - - and said housing or between said support ring - - as ln 2 of the clm states "one of" which is being viewed to mean in the alternative, A or B not A and B. (see 35 USC 112 below)
- Clm 6, ln 3 reads "a spiral spring and a plate spring" the examiner believes this should be - - a spiral spring or a plate spring - - as ln 2 of the clm states "one of" which is being viewed to mean in the alternative, A or B not A and B. (see 35 USC 112 below)
- Clm 11, ln 2 reads "sleeve bearings and rolling bearings" the examiner believes this should be - - sleeve bearings or rolling bearings - - as ln 2 of the clm states "one of" which is being viewed to mean in the alternative, A or B not A and B. (see 35 USC 112 below)

- Clm 13, ln 3 reads "a relay and by means of FET" the examiner believes this should be - - a relay or by means of FET - - as ln 3 of the clm states "one of" which is being viewed to mean in the alternative, A or B not A and B. (see 35 USC 112 below)

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 5, 6, 7, 11 and 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re clms 5 and 7, it is unclear what the applicant is attempting to clm by the phrase "disposed between one of said loose bearing and said housing and between said support ring and said housing." Is the applicant attempting to clm that the spring is between the loose bearing and the housing, the support ring and the housing, or the bearing and the support ring.

Re clms 6, 11 and 13, it is unclear what the applicant is attempting to clm by the phrases "one of X and Y" (X being a spiral spring (clm 6), sleeve bearings (clm 11) or relay (clm 13) and Y being a plate spring (clm 6), rolling bearings (clm 11) or FET semiconductor elements (clm 13)). It appears by the phrase "one of" that the applicant is attempting to clm the devices in the alternative however the word "and" makes it appear that the applicant is claiming that both structures as being present. Does the

applicant mean to clm X or Y OR X and Y? The clms has been treated as if applicant is attempting to clm X or Y.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al, USP 6,550,567, in view of Alexander Kapelevich's article "Geometry and design of involute spur gears with asymmetric teeth" (Published in "Mechanism and Machine Theory" Volume 35, Issue 1, January 2000, pgs 117-130).

Murakami discloses a worm gear for a vehicle steering system comprising:

- A shaft (attached to worm gear 71) swivably mounted for swiveling in the radial direction (in the direction of Y)
- A worm (71) disposed in a rotationally fixed manner on said shaft (71 is part of shaft)
- A worm wheel (72) preloaded in the radial direction (meshing with teeth of worm causes some preloading)
- A housing (8)
- A fixed bearing (11)

- A loose bearing (10, moves inside and relative to 22 via elastic members 20)
- A slot (81)
- A support ring (22), said loose bearing (10) bears against said housing (8) via said support ring (22, 20 connects the bearing to the ring, the ring connects to the housing)
- A spring element/anti-twist device (20, elastic member) disposed between the loose bearing and the housing (via the support ring 22). It is to noted that the spring and anti-twist device are the same device as disclosed by the applicant on pg 8 ln 14 of the specification submitted on 11/4/04.
- The spring element is a plate spring (Fig. 8 shows the elastic member 20 as a plate spring), or a leaf spring (Fig. 5 shows the elastic member 20 as a leaf spring connected to the housing via the support ring)
- A motor (6)
- The worm (71) is cantilevered on the shaft (see Fig. 4)
- The shaft is mounted in the housing (8) by means of rolling bearings (fixed bearing 11)

Murakami does not disclose that the worm wheel has teeth that have different pressure angles on the left and the right so that the normal force between said worm and said worm wheel is independent of the direction of rotation of a torque exerted on said worm by said worm wheel.

Kapelevich teaches a gear that has teeth that have different pressure angles on the left and right (also known as asymmetric gear teeth, see Figure 4 of Kapelevich, Φ_{rc} and Φ_{rd}) so that the normal force between said worm and said worm wheel is independent of the direction of rotation of a torque exerted on said worm by said worm wheel for the purpose of providing an increase in load capacity while reducing weight and dimensions of the gear (pg 13, Conclusions).

It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the teachings of Murakami and provide a gear that has teeth that have different pressure angles on the left and right so that the normal force between said worm and said worm wheel is independent of the direction of rotation of a torque exerted on said worm by said worm wheel, as taught by Kapelevich for the purpose of providing an increase in load capacity while reducing weight and dimensions of the gear.

8. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al, USP 6,550,567, in view of Alexander Kapelevich's article "Geometry and design of involute spur gears with asymmetric teeth" (Published in "Mechanism and Machine Theory" Volume 35, Issue 1, January 2000, pgs 117-130) and further in view of Lu et al, USP 6,046,560.

Murakami in view of Kapelevich discloses all of the claimed subject matter as applied to clms 1-11 above and Murakami also discloses that the motor (6) has an output shaft (12).

Murakami in view of Kapelevich does not disclose that the motor has three-phases and FET's are used to short-circuit at least two phases.

Lu teaches that a motor has three phases (Aa, Bb and Dd) and FET's (switches) are used to short-circuit the phase (turn the phases on and off C9/L39-C10/L12) for the purpose providing a motor that has the capability of adjusting current through the phase to assist in the steering of a vehicle (C10/L11-12).

It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the teachings of Murakami in view of Kapelevich and provide a motor has three phases and FET's are used to short-circuit the phase, as taught by Lu, for the purpose providing a motor that has the capability of adjusting current through the phase to assist in the steering of a vehicle.

Double Patenting

12. Claims 1-11 and 14 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 6,860,829 in view of Alexander Kapelevich's article "Geometry and design of involute spur gears with asymmetric teeth" (Published in "Mechanism and Machine Theory" Volume 35, Issue 1, January 2000, pgs 117-130). Claims 1-11 and 14 of USP 6,860,829 discloses a worm gear for a vehicle steering system which comprises a shaft, a worm, a worm wheel, a housing, a fixed bearing, a loose (moveable) bearing, a support ring, and a spring element. Claims 1-11 and 14 do not disclose that the worm wheel has teeth, each said tooth having right and left tooth flanks which are inclined at respective

pressure angles that are different between the left and right flanks (also known as asymmetric gear teeth, see Figure 4 of Kapelevich, Φ_{rc} and Φ_{rd}). In view of the teachings of Kapelevich it would have been obvious to one having ordinary skill in the art to modify claims 1-11 and 14 of USP 6,860,829 and make the gear teeth asymmetric, as taught by Kapelevich, for the purpose of providing an increase in load capacity while reducing weight and dimensions of the gear (pg 13, Conclusions).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James Pilkington whose telephone number is (571) 272-5052. The examiner can normally be reached on Monday-Friday 8:00AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Ridley can be reached on (571) 272-6917. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JP
10/30/06

RICHARD RIDLEY
SUPERVISORY PATENT EXAMINER